DOCUMENT RESUME

ED 237 337 SE 043 542

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TITLE Mangroves and Seawalls. "Increased Pressure for Land Fill Will Cause More and More Stress to Natural Areas." Grades 7 and 8. A Three Lesson Unit. Student Learning Activity Module.
INSTITUTION Lee County Board of Public Instruction, Fort Myers, Fla.
PUB DATE 83
NOTE 25p.; For related document, see 043 543.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Ecology; *Environmental Education; Forestry; Grade 7; Grade 8; Junior High Schools; *Learning Activities; Marine Biology; Science Education; Secondary School Science; *Trees; *Water Resources
IDENTIFIERS *Estuaries; Florida; *Mangroves

ABSTRACT

This module is an activity/discussion-centered unit focusing on the importance of shoreline surface area. The module is part of a series designed to be used by teachers, students, and community members to help them utilize community resources in developing and teaching environmental concepts and responsibility, and in seeking ways to solve environmental problems. Background information and lesson plans are provided. Also provided in an appendix are pre-post tests and masters for duplicating of two graphics, "Mangroves to Seawalls" and "Shoreline Graph" (both of which are required for student activity in the second lesson). In addition to the general information presented in the background information sections (such as the role of red mangroves in increasing the surface area of the estuary shoreline which allows large numbers of organisms a habitat for growth), six reasons why mangroves should not be allowed to be filled, bull-dozed, or altered in local counties or any other part of Florida are summarized. These reasons focus on mangrove productivity, shoreline protection and stabilization, runoff and pollution trap, wildlife habitat area, mangrove dollar economics, and uniqueness of the mangrove forests. (JN)

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ED237337

STUDENT LEARNING ACTIVITY MODULE

A THREE LESSON UNIT

GRADES 7 and 8

Mangroves and Seawalls

"Increased pressures for land fill will cause more and more stress to natural areas."

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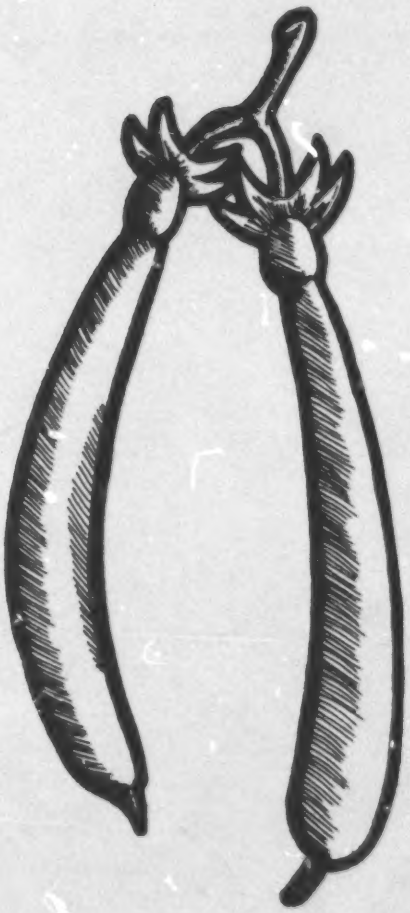

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SE043542

Introduction

"Mangroves and Seawalls" is an activity-discussion centered unit dealing with the importance of shoreline surface area. Red mangroves increase the surface area of the estuary shoreline. This increase allows a large number of organisms a habitat for growth. When the mangroves are removed, a large number of other organisms are also destroyed.

Since many teachers do not understand the value of the mangrove shoreline, background information is included in this module. A pre and post test and masters for student handouts are also included.

Background material for the teacher:

Address by John L. McQuigg
University of Florida
Bulkhead Seminar
May 21, 1965

THE ECONOMIC VALUE OF

PRESERVING THE NATURAL SHORELINE

When I accepted the invitation to address this blue-ribbon group on "The Economic Value of Preserving the Natural Shoreline", I didn't realize the amount of work, reading, research and soul-searching that would be involved in preparing a paper that could make a sound contribution.

Strangely enough, very little information has been published bearing directly on the economic and production values of our estuaries and wetlands resources. That they are beyond question fantastically valuable to Florida will be indicated in the material I present, but we badly need further and detailed study in order to adequately appraise them.

It goes without need of proof that good fishing and Florida are synonymous. Our gigantic tourist business, our attraction for the affluent retired, our commerical fishing, the boating industry, residential building, even the attraction of clean industry are majorly affected by the maintenance of good fishing, and I'll present facts on those aspects later. But I think all of us can agree in principle -- whether we're sports fishermen or not -- that the sport of fishing is important to Florida.

The distinguished biologists and ecologists here with us these two days will prove -- I trust -- that you can't have good fishing and the destruction of vital estuarine bottomlands. Good bottomlands for spawning and nursery precede good fishing. You can't have one without the other. So somewhere along the line a decision has to be made -- hopefully before too much more is lost.

Now, I'm not against progress and development. No conservationist really is. We're not old fogeys, bird-watchers or old ladies in tennis shoes. But many of the things done under the name of progress are not really so. And much of the estuarine destruction and pollution can be avoided. Progress need not be despoilation, development can be guided, speculation can be channeled to protect maximum overall values. We know population growth will continue and must be housed. Florida will continue to attract people of all types. Incomes will rise and families will have more leisure time. Waterfront and associated sports will be desirable -- even essential to this growth. Indeed it is basic to my story that preparation for this sound growth of Florida carries with it the need and the obligation to protect our bottomlands or we will not make the satisfactory and high-quality growth to which our natural resources entitle us.

This is the cold fact: There are other ways than dredge-and-fill to develop property. There is no other way to provide spawning and nursery grounds ... and this should give everyone pause. Once Mother Nature's works have been despoiled and altered, that change is irrevocable. It can't be changed back. It's gone forever.

Biologists say estuarine bottomlands are the most productive areas on earth. Geologists say it took Nature 20,000 years to create a marsh. Yet in a matter of days, drainage and fill and dredging can ruin them forever.

There can never again be fruitful spawning grounds at Ft. Lauderdale, or Lake Worth, or upper Biscayne Bay, or Tampa Bay, or Boca Ciega. The South Fork of the St. Lucie River at Palm City can never again be a clean, deep river -- once called by the late President Hoover the finest fishing in America. The grounds are sterile, the waters polluted, the silt-laden bottomlands are dead.

Marshes and baybottoms are a "factory" of basic animal and plant nutrients, contribution to the fabulous wealth of coastal waters that support our fish and shellfish resources ... indeed they are the very essence of the chain of life. They are delicately-balanced complexes as fragile as an eggshell. Each acre is irreplaceable. And what we save now is all that ever will be saved ... the rest is gone.

I hope from the bottom of my heart that these ecological experts here can nail down these vital points to you. They're hard for many well-intentioned people to accept, for traditionally Americans have looked on wetlands as wastelands. Very few citizens have any great love for a swamp, indeed are more often that not a bit afraid of these areas of muck, shifting sands, pungent odors, mosquitos, creeping and crawling aquatic creatures, strange sounds in the night and lonely solitude by day. Yet they are vital, and must be preserved.

I hope by this point you've decided that as a conservationist I'm emphatically opposed to dredge and fill. I'm not opposed to growth and progress -- but I want it to be wise and carefully done to preserve natural values. I want it to be kept within bounds and tailored to scientific ecological knowledge. I want to preserve heritage that truly for Florida is the goose that lays the golden egg.

And development can be done and still preserve natural values and esthetics, too. We have right here in Martin County some good developments that have done no ecological harm at all, yet have produced high-quality, highly-desirable residential communities. We have some others in which compromises were made, yet they saved anywhere from 60% to 80% of the natural values. And we have some atrocities too. Our fear is that with accelerated growth we'll be faced with more of this latter kind ... which, believe me, we're prepared to fight. And prepared to win, too, for the whole direction of high-level public and political thought -- both nationally and in Florida -- is toward better conservation.

I've said I was against dredge and fill, as a conservationist. There is nothing unusual in a conservationist taking that position. But now, after three months of reading and study and thought on the economics of preserving our bottomlands, I'm against it as an Economist as well ... and I believe there are facts to prove that view point.

I'd like to start the purely Economics part of my remarks with a quotation from one of the most respected economists of our times, the late Dr. John F. Sly, of Princeton University. Addressing the Florida Industrial Council, Dr. Sly had the temerity to say to this group:

"You are interested in improving Florida's position as an industrial state. Sometimes I wonder why there is this great urge for industrialization. In the private sector it may mean a higher standard of living for those who profit; and in the public sector it means larger tax bases to support more public services to attract still more people ... But there is another side. No one wants to turn Orlando, St. Petersburg, or Tallahassee into another Newark, Jersey City, or Trenton. We are looking for what we call "polite industries"; no smoke, no dust, and a high quality of professional and technical personnel. The new industrial plants that have recently located in Florida seem to fit rather well into the "polite" category. There is this question, however; how much industrialization do you want? While the Florida Council of 100 is pushing this ratio up would it not be wise to have another Florida Council of 100 equally dedicated to the development and preservation of Florida's great natural and social values, which in spite of all the impressive economic indices is what really brings people here".

Back just after World War II, I participated in an operation for the United Aircraft Corporation that has a definite relationship to Dr. Sly's caution. At that time I was with a company that had United Aircraft as a client. Under the pressures of diversification and dispersal as required after the war, United Aircraft was looking for other locations for factories, the problem of where professional executives and skilled technicians would like to live, and would therefore be attracted was important. To get a check on this, we ran advertisements in various parts of the country asking prospective employees to hold up their hands. The ads were all the same except for the proposed location of the factory -- some ads said Connecticut, some California, some Arizona, some Texas, some Florida. So people really were picking the place they wanted to go. The overpowering majority-more than all the other states combined -- answered the Florida ad! In the questionnaire that followed-up the inquiry, more than 70% gave as their reasons, "good fishing and good waters". Without these assets for Florida, the location would have been elsewhere where freight rates, transportation, raw materials, etc. were more advantageous.

I know intimately another company that moved to Florida solely because the head of that company wanted to live and work in the area where he and his family had fished for 35 winters.

I'm sure that Florida's natural resources -- and most importantly, their preservation -- are a major component of the economic hopes we have for industrial growth.

Another economic generality; one of the major political excuses and speculative arguments for unnecessary dredge and fill is the statement that "we must get those wastelands on the tax roll". This indeed is a snare and a delusion.

Never in history has the addition of property to the tax rolls reduced an individual's taxes. Always has the cost of serving, and the investment required, gone up as an area grew, not down. All you have to do is look at your own tax bill over the past few years to see that. Or check the tax rates of various size cities. Invariably the rate and the amount goes up with the size of the city. Invariably! If you want growth and development for other reasons, O.K. But, let's not kid ourselves, or try to kid others, that we want it to get land on the tax rolls.

A survey in Los Angeles County showed that the long-term investment to serve growth worked out at $10,500 per new family. At that rate, it would take 50 years even to get the bait back, and realistically, the only answer is increased taxes, which is exactly what has happened. For instance, right here in little Martin County it costs $740 per year just to send one child to school. How many new homes -- waterfront or not -- represent a sound economic reason for filling lands to get lots on the tax rolls?

Most dredge and fill development has been done, and is desired by developers, for the simple economic reason that it was the cheapest way to acquire land. Submerged lands even recently have been sold for as little as $200 - $400 per acre. Some recent sales on main traffic arteries have have gone for $1580 - $1700 per acre. Dredge rights for surrounding acres then are sold -- and despoiled -- for as little as 3¢ - 5¢ per cubic yard of fill. Operations and bulkheading are done for $2000 per finished acre. Roads, curbs, and drainage don't enter the cost because they would have to be performed on any land. The result is that for $2500 per acre, choice waterfront locations have been acquired.

Where such submerged lands -- in minimum amounts -- should be included in a sound development plan, they should be priced at amounts that adequately repay the public who owns them for their loss.

What is their worth?

In the past, various formulas have been used -- all the way from prior sales to the appraised value of the finished land. I submit this is not their worth to the public which loses the good fishing they provide.

Florida has not made -- but should -- economic studies of the value of its productive bottomlands. Other states have, including California, Texas, Alabama, Virginia, North Carolina and others. The annual production value of these lands has been stated by scientific appraisal at from $200 - $356 per year in Alabama, $380 in Texas. Oyster bottoms in the Chesapeake at from $1000 - $2500 per year. This is annual value, and should be capitalized.

The Laguna Madre behind Padre Island in the Texas Gulf is very similar to the Indian River estuary. The University of Texas established its annual production value to the State at $370.18 per acre. Capitalizing this at 5% -- or 20 times -- gives a shocking view of the true value: $7403.60 per acre. Then add the value of the 2 acres that are despoiled for every acre filled and you get $22,210.80 per acre that the land is worth based on its production value alone. This is not a bubble-headed figure, but a sound capitalization of annual production that is followed in the stock market, in the sale of farm land or apartments, or in any other income-producer. This is the economic value -- to Florida -- of our vital spawning areas and nurseries.

Obviously there occasionally are situations and areas where sales of bottomlands should be made. But an appreciation of their long-term value enables us to start from an understanding of their true worth, and will make us go slowly, will make us be sure the plan is right, and in the public interest, will keep unwise sales to a bare minimum.

Now for some figures that don't require such an abrupt change of theory and thinking. I hold no brief for the absolute accuracy of these values (and I'll explain how I got every one of them), but after all, my purpose is to present a viewpoint on the Economic Value of Florida's Bottomlands, Bays, and Estuaries. The figures are reasonably correct -- can't help but be and certainly show we're not talking about peanuts. They demonstrate the tremendous stake we have in the maintenance of good fishing -- which can be maintained only if we maintain our vital spawning and nursery gounds.

Some of the values I'll use are completely accurate, actual recorded facts. Others are based on excellent research that is accepted by private industry and by State and Federal Governments alike. Others are conservative "educated guesses" based on my own reading and research of government documents, industry figures and scientific opinion. They are so important to the present and to our future growth that they should point the way to a preservation program of the sternest kind. Bear in mind these are annual figures. (Except for tourism, figures used are for the year 1964. They could be increased by at least 15% for the Factor of inflation alone.)

The value of Florida's commercial fishing is a matter of record. However, the State statistics represent only the actual commercial landings and the Salt Water Conservation Board estimates that they could at least be doubled to account also for the sales of private fishermen. I have not done that, which makes this figure extremely conservative. For 1964, Florida's commercial fin-fish production was worth, at wholesale $30,790,109.00
our shell-fish amounted to 20,331,218.00

Even bait is a substantial business. Records are kept only on shrimp, which bait dealers tell me is less than 1/4 of the bait business. Live shrimp alone produces a business of $1,382,362, and projected to 100% this is a dollar volume -- bait alone, mind you, of 5,529,448.00

Boat sales are a tremendous business in Florida. We have 3% of the U.S. population, but 4.8% of the nation's recreational boats -- and we use them more than in other States. So 4.8% of the Engine & Boat Manufacturers Assn. figure of a $2,605,000,000 industry sets up for Florida a conservative annual figure of 125,040,000.00

Boat fuel and upkeep are an "educated guess" as no specific figures are available. However $200 per boat annually for fuel, bottom painting, insurance, repairs is certainly conservative. Boat-owners among you will know it is ridiculously low. Multiply this $200 by Florida's 385,000 recreational craft and you get an annual figure of 77,000,000.00
NOTE: (A 1969 study in Ft. Lauderdale shows that the value of the overall boating industry to Broward County alone was $200,000,000 in 1968.)

The biggest figure, as you might expect, is the influence of Florida's good fishing on our tourist economy. Florida's Development Commission research and figures are accepted everywhere. They show that tourism is a $4.5 billion dollar annual business in Florida, and that 31% of our visitors come for the fishing (incidentally, for second time and repeat visitors the percentage is even higher). The same research shows that an additional 18% come for boating, but I have used only the fishing figure. I don't think anyone could deny that good fishing produces 31% of Florida's tourist economy, so that figure amounts to $1,395,000,000.00
And remember, too, our tourists carry more than 20% of the tax burden in Florida.

We've all seen the waterways and marinas crowded with out-of-state boats. These visitors are free spenders and stay many weeks or months. However, I've used only the average figure of an 11.3-day stay, and the average expenditure of $244.35. Multiplying these low figures by the 100,000 people who come by boat each year shows an annual expenditure of 26,878,500.00

Fishing tackle sales, based on the projected income from the 5% special fishing tackle tax, amount to more than 40,000,000.00

Here's a guess, but an "educated" one. Charter boats are big business and each year produce 23,250,000.00
This is 3100 boats, multiplied by one-third of the year or 125 days, multiplied by an average day's fee of $50. Charter-boatmen I've interviewed believe these estimates to be conservative.

You can estimate the business of the hundreds of big marinas scattered around the State. Hundreds of millions of dollars have been invested, and the income must be substantial. However, I've used only 27,500 visiting boats, times a $5 per day dockage fee, times a 13.5 day stay. This amounts to 1,866,250.00
and you know it's far more than that.

The total of these direct figures -- and I repeat, I believe they are completely conservative -- adds up to an annual expenditure, directly dependent on the maintenance of good fishing in Florida, of $1,746,875,525. I want to emphasize these are annual figures, and say again, 3/4 billion dollars a year isn't peanuts.

Now, you can quarrel with the figures if you want to. Whether they are of absolute accuracy is not the point. They are reasonably accurate,

they are completely conservative -- and they make the point that good fishing is a fantastic economic asset for Florida. It is our biggest single economic factor, and it can grow each year. It must be maintained.

There are other economic assets to the maintenance of good fishing.

Convention business in our bigger cities for example. It's more than coincidence that the charter boat fleets are sold out weeks in advance of a national or regional convention.

Of all the Florida tourists, 6% admit they are here looking for homes and property. That's 852,480 people here each year looking for homes! Many of them buy, many others make up their minds, basing decisions on Florida's waters and fishing.

160,000 people each year represent the in-migration of people who come here to make their homes. It is estimated that more than half these people are the highly-desirable "affluent retired" who choose Florida over Arizona, California, Nevada and other retirement States because of our waters and fishing. This means the building of 50,000 or more homes each year at an average certainly of $15,000 -- which is an annual construction business of $750,000,000, plus all the service and retail expansion it makes possible.

A brief word about the economic value of this class of resident would be appropriate here. These are people who no longer need to save their money or carry investment of life insurance programs. They spend the bulk of their incomes. They don't have children to go to school. Their properties are already improved. They make few requirements on local governments. The area in which I live -- North River Shore -- is a good example. This development, incidentally, was done with no ecological damage, as a matter of fact with some improvements. Our 137 homes -- most of whose owners are retired and picked this area for its fishing -- pay over $78,000 in county taxes. We have only 13 children in school and 32 street lights, for a cost to the county of $7,534 -- a clear profit of $70,466 -- 700%! Certainly this type of settler is an economic asset to Florida and they number in the hundreds of thousands in our State, largely due to good fishing.

Well .. I'm about at the end. I hope I've demonstrated the tremendous economic stake Florida has in the maintenance of good fishing, and therefore in the protection of its vital bottomlands and spectacular estuarine resources. We've ruined them at an alarming rate, and we must stop. An understanding of their basic economic value will, I hope, stimulate added strength and emphasis in stopping their sale.

I'd be remiss if I didn't also make the point -- entirely beyond economic dollar figures -- that these bottomlands have great value to the Florida tax-paying public who owns them. Legally, as I understand the plainly written words of the law, title to all submerged lands, baybottoms and estuarine lands, seaward of the line of mean high tide are vested in the "inalienable ownership of the general public, to be guarded for the public good by the State".

And does this public use and benefit from these lands? They certainly do! The Recreation Commission has figures showing that 42.5% of our citizens are regular salt-water fishermen -- 31.3% regular salt-water boatmen. They spend 59,800,000 man-days on the waters -- which is an average of at least

14 days a year for every soul in Florida! That's heavy usage, and of great value to every resident.

I think any speaker who has the temerity to set forth his ideas and convictions on a problem, should also have some ideas on a solution. I have some, and here they are:

1. Since the bottomlands are owned "inalienably" by the people, their rights and interests should take precedence over the rights to private profit at public expense. This is not to say that some lands shouldn't be filled. It is to say that such projects should be carefully considered, should be held to a bare minimum, should be strictly controlled, and should be approved only after a clear-cut demonstration that they will advance the public good. Also, this is not to say that riparian rights are not real. They are, but basically they are limited to right of access, use, protection and view -- not to a private right to profit by destruction of valuable public property. There's been too much of that in Florida. If this proposed policy were followed development could be made reasonably non-destructive, and could be limited to only wise and satisfactory plans.
2. We should educate constantly that bottomlands are valuable and when necessary should be sold only at a price that represents their true value to the public and not the estimated value of the completed land, and should be sold only in absolute minimum quantities.

3. There should be the requirement for an ecological survey prior to any sale. Rarely, some bottomlands are sterile or of minimum value. Further, such a study will develop ideas and plans that will result in minimum damage. In most cases -- if adequate values are placed on bottomlands-- plans can be worked out to develop landward of the water rather than seaward and everyone benefits. (Ted Randell's Act has accomplished this since this paper was written.)

4. Severe engineering restrictions should be placed on the operation. Dredging is even more destructive than fill and should be discouraged. Access channels should be dug hydraulically, with spoil deposited behind dikes, to prevent silting and destroying of countless additional acres. Any dredging approved for fill should be from beyond the euphotic line, generally recognized as six foot depths or less. Fill from the outside should be encouraged in place of dredging. Tidal flats, mangrove growth, islands and pristine areas should be set aside for preservation. Imaginatively done, they can add to the final value.

5. Bulkhead lines should be minimum, should be area-wide and should follow natural shorelines. Both Florida and U.S. conservation authorities recommend 1 foot below mean high water as the bulkhead line. This recognizes that dredge-and-fill is a vicious circle -- one project begets another until the total destruction sets in. The loss thus is progressive ... less bottom, less food, less life-subsistence, less fish and crustaceans ... ultimately leading to sterility.

For the fisherman among you -- and for those of you who only eat and don't enjoy the royal sport of catching them -- let me give you one final quote from Dr. Lionel A. Walford, Director of the U.S. Sports Fisheries Marine Laboratory at Sandy Hook:

"Most of our important fish depend on the part of the coastal plain biologists call the estuarine zone. This includes bays, rivers, and tidal creeks. Fish eggs are spawned or drift shoreward and the tiny larvae are carried into the shallow fertile waters of the estuarine zone. Here they are nourished and protected until large enough to fend for themselves. Man is ruining the estuarine zone at a frightening rate. Pollution of the waters with waste materials, herbicides, and pesticides is helping ruin the zone. But worse is the filling-in of large stretches of the zone to make more land, and by so doing, forever obliterating it as a habitat for aquatic life."

The fish he's talking about, including many others, are Sea Trout, Mullet, Striped Bass, Flounder, Redfish, Pompano, Snapper, Snook, Drum, Tarpon, Cobia, Spiny Lobsters, Blue Claw Crabs, Shrimp, Oysters and Clams. What a dreary Florida without them -- both to catch and to eat!

This is all serious business -- serious for Florida and for many other parts of the United States. It no longer is political maneuvering to make submerged lands available for private development. The whole subject has a tremendous bearing on the Economics of Florida, on the protection of resources for our present and future residents, on our solid growth in wealth and population even on our growth in the clean type of industry we want.

I have documented direct monetary values of more than $1 3/4 billions a year. Add new home construction, high-spending retirees, attraction of additional industry, and all the other factors I've only mentioned -- and carry away with you some idea of the stakes involved.

I haven't talked about the beauties of natural conditions, the values of wildlife, the need in this hectic world for the honest recreation they provide. To many millions of people, these esthetic values far exceed the dollars-and-cents that figures show.

I hope by putting an economic evaluation on the value of our Florida bottomlands, I've advanced the cause of their preservation.

Background on Mangroves:

"A CASE FOR MANGROVES"

by
William Hammond, Director
Environmental Education
Lee County, Florida

As people continue to settle in, and visit the Southwest Florida coastline in rapidly increasing numbers, the time for making irreversible decisions dealing with environmental quality and development is at hand.

To this date the final considerations concerning most mangrove fills have been primarily decided from the viewpoint of the economics of man rather than the economics of nature resulting in shortsightedness, little understanding of the overall outcomes and general disregard for the broad scale views or long term effects such decisions carry.

In this light, I would like to review the role of the estuary in Southwest Florida and, indeed, all of Florida.

An estuary can be defined as a semi-enclosed coastal body of water which has a free connection with the open sea and within which sea water is measurably diluted with fresh water drained from land drainage. Estuaries are the most productive environments on the earth.

Our estuaries are biological communities of extremely delicate balance. Dr. Clarence P. Idyll has suggested they may be the results of "a million years of balance". "Without doubt," Dr. Idyll (Univ. of Miami) testified at the recent oil drilling hearings in Tallahassee, "the most important message the ecologist must get across to the general public and to those responsible for making laws and regulations of our country is that estuaries once destroyed are forever destroyed."

Dr. Eugene P. Odum of the University of Georgia read an important research paper at the 16th session of the Gulf and Caribbean Fisheries Institute in 1965.

He showed how marshes recycle phosporus and nitrogen continuously and how the vital plant food is produced throughout the year. He showed how marshes, often foul smelling, often slimy with algae, normally teeming with sandflies and mosquitoes, are nearly 7 times as productive as the average wheat field, 20 times as productive as the open sea, nearly twice as productive as the best corn land, and about equal in basic production of organic material to the annual production of sugar cane on rice land.

"The astonishing thing about all this is that man does not have to turn a hand to make this great crop ready for harvest. There is no fertilizer bill to pay, the food is produced free for the taking. But it can be taken away by destruction of the factory or the factory which relies upon abundant light and a dependable supply of nutrient materials. Production depends upon the rise and fall of the tides to transport the raw product to the waiting consumer."

This really is more significant to us when we realize that Dr. Odum's report was based on studies with salt marsh grasses (Spartina sp.) in Georgia and the Carolinas, whereas our mangrove forests in Southwest Florida have been shown to be substantially more productive than even the fertile salt marshes Dr. Odum describes. Dr. Eric Heald of the University of Miami research studies established a production figure for Red Mangroves in the Everglades basin at 8.8 tons/ha/yr., very significant when compared to 2.5 to 6.8 metric tons/ha/yr.

Thus, even the laymen can see that our mangrove forests in Southwest Florida are the most productive forests in these entire United States and possibly, the entire world, with the exception of some tropical rainforests.

What does biological production mean in an estuary?

The productivity we speak of refers to the ability of the mangrove trees to transform sunlight, water, and minerals into living material which is, in turn, shed into the estuary in the form of leaves, twigs, etc., called detritus. This detritus has been proven to be essential to the survival of almost all our fish, shrimp, crabs, shellfish, and other invertebrates, both in the estuary and offshore (since up to half the detritus is flushed out to sea to serve as food source for plankton and shellfish).

With this general overview of the importance of the mangrove dominated estuary system, I would like to briefly summarize six reasons mangroves should not be allowed to be filled, bull-dozed or altered in local counties or any other part of Florida.

1. Productivity - The predominantly Red Mangrove detrital based system is one of the most productive, biologically, in the world with all our commercial, sport, and intermediate living marine species depending upon its maintenance as a basic component in their survival. i.e., In Boca Ciega Bay in St. Petersburg, Mr. Kenneth Woodburn, formerly of the State Board of Conservation Marine Research Division, reports biological surveys indicate a 90% reduction in all life forms, resulting from the finger canal dredge and fill activities in that bay. Mr. James Sykes, Director of the National Marine Fisheries Service Laboratory in St. Petersburg, referring to studies of Boca Ciega Bay and others, showed that "bay bottoms surrounded by finger fills undergo progressive siltation and remain biologically unproductive even after a decade."

2. Shoreline Protection and Stabilization - Red Mangroves are the primary back bay land builders and shoreline stablizers. They assist, with their characteristic prop roots, in reducing runoff siltation by acting as wave energy absorbers, thereby preventing wave and tidal erosion along shorelines. They serve as one of the most effective means of coastal hurricane buffers protecting upland and populations and properties from flooding and wave generation destruction by absorbing and diffusing wave shocks and mechanically retarding rising floodwaters.

   One can only surmize what effect removing mangroves will have on coliform bacteria counts in our bays and rivers with large areas of counties on septic tanks or package sewer plants draining and seeping into creeks and drainage ditches which all end up in our bays.

It is, however, quite conceivable that the borderline bacteria counts now existing will no longer merely be borderline for swimming and recreation if mangroves are removed.

4. Wildlife Habitat Area - The Red Mangrove and the associated black mangrove forests and keys are the major breeding and feeding grounds for a majority of our wading birds, estuarine fish, and intertebrates not to mention the endangered Pelican, Bald Eagle, and Shellfish.

   In addition, Dr. William Odum's research points out the key role that black mangrove plays as essential nursery gound for many game-fish (Redfish, Sea Trout, Snook, etc.) and other juvenile wildlife forms -- a role that has been overlooked by many.

   Whether we are sophisticated enough to realize it or not, the well being and survival of these organisms is essential to many forms of Wildlife and is continually being consumed and the resultant decrease in associated wildlife is evident. It is not a question of man or wildlife.

5. Mangrove Dollar Economics - On an address to the University of Florida Bulkhead Seminar and published in the C-70's Legislators' Environmental Guide (Sept. 1969), Mr. John McQuigg reported on the economic value of mangroves and shorelines based on 1964 statewide statistics, all documented and accounted for and very conservative in estimate, and established the production value of each acre of Florida estuary at $22,210.80 per acre of estuary bottomlands and primarily mangrove and and seagrasses. This figure can be easily substantiated and makes the filling of mangrove properties for the $500 - $2000 a developed acre brings into the county tax rolls (from people who could live elsewhere in the community) absurd for anyone but the developer making the profit to consider. What about the public interests?

6 Uniqueness of the Mangrove Forests - In all of the United States the only substantial Mangrove Forests exist in S.W. Florida, particularly southern Sarasota, Lee, Charlotte, Collier, and Everglades National Park, along with forest remnants on the lower east coast of Florida. These forests were considered, particularly in Lee County, to be unique enough to become the first Aquatic Preserve, the nucleus for a major National Wildlife Refuge and a State Park. We are being hasty, indeed, when we are so anxious to remove the productive estuary producer that others throughout the state and nation have judged as truly unique.

   Is the developer, businessman, zoning representative, and commissioner who is ready to see the mangroves filled for immediate profits and population growth really as competent and intelligent as he purports? Has, in fact, a scientific, comprehensive study of why and what the tourist and settler seek out in South Florida been accomplished and made public? Could it be that South Florida now offers a different productive estuary system and all the good things that go with it, when compared to the majority of the remaining "developed" coastlines which, aside from the beaches beyond the buildings, are really not much different from one another? Indeed, it is the very unique productive estuary condition present that attracts people to South Florida and now needs protection from those same people it has attracted.

   Therefore, it is essential if South Florida counties are going to remain unique that:

1. An immediate moratorium be placed on all bulkhead applications.

2. The local County Commissioners adopt new ordinances (as within the powers granted them during the 1971 legislative session) to establish a bulkhead line which is consistent with the shoreward border of Rhizophora mangle (Red Mangroves) or, better yet, adding the shoreward border of any pure stand of Black Mangrove. Ideally, the bulkhead line should be set at the transition zone of marine and upland plant communities. Unfortunately, while biologically sound, this line is politically and economically unattainable in today's society.

3. The County Commissioners should set up a comprehensive zoning study and plan for carefully regulating the type of development and population density allowable on the fragile estuary flood plain.

In effect, the Red Mangrove and Cordgrass or Spartina, along with those areas with pure stands of black mangroves should be excluded from development (excepting shrub sized Red Mangrove trees which may be growing upland of the mean high water line). White mangroves and/or buttonwood would be developable. Mixed stands of trees which include black mangrove should be developed only with careful considerations of the developer with county officals and state biologists.

In conclusion:

"We advertise the beauties and attractions of Florida; we send our agents and literature to call the people of the northland to come and spend their winters and to be permanent residents with us. Then we destroy every vestige of its natural beauty, we cut down the hammocks, drain the lakes and mutilate the rivers. We clear out the mangrove borders which nature created to guard our shores from destruction by the sea during hurricanes and in their places we build hideous seawalls. The only attraction belonging to the State that we do not ruin is the climate --"* and now we are working on that with air pollution and climate alteration through land drainage.

<u>Isn't it time we learned from the past as time is rapidly running out!</u>

*From Simpson's "Out of Doors in Florida", (pp. 136-137, reprinted in 18th Annual Report of the Florida State Geological Survey, 1927.)

Lesson One

A. Give pre-test (see Appendix).

B. Discuss the following statements and questions with your students. Use the background information in the Introduction section for facts.

1. What is a mangrove?
2. How do mangrove roots catch and help stop erosion of shorelines?
3. Mangroves are used by many birds (egrets, herons, ibis, and pelicans) for perching and nesting.
4. Fish and other animals feed on plants and animals that attach to mangrove roots.
5. Fish, crabs, and other marine animals use mangroves for a home.
6. Mangroves help cushion shorelines from waves and protect inland areas during hurricanes.
7. Are mangrove areas good for fishing?
8. Mangrove leaves are continually falling from the trees. These leaves are then invaded by molds and protozoa. The leaves and their animal and fungi populations are eaten by fish, crabs, and shrimp larvae. Thus the mangrove food web of the estuary.
9. What is best for the economy of an area that has mangroves -- many years of people spending money to fish in mangrove areas and the money made from shrimp, fish, crab industries that depend on mangroves; or a one shot money making situation from dredge and fill operation resulting in a condominium development site?

Lesson Two

A. Mangrove to Seawall Activity

1. Materials

   a. One ditto or mimeograph copy per student of the "Mangroves to Seawalls" page found in the Appendix.

   b. One ditto or mimeograph copy per student of the "Shoreline Graph" page found in the Appendix.

   c. One piece of string approximately 25 inches long per student.

2. Procedure

   a. Give each student a 25 inch piece of string, a copy of the "Mangrove to Seawall" ditto and the "Shoreline Graph" ditto.

   b. Students should place the string on the "mangrove line" for 1950. After the string has been placed over the entire line, the string should be pulled straight. The length of the string is then measured with the "Mile Ruler" at the bottom of the "Shoreline Graph" page.

   c. Record the length of the 1950 shoreline and make a bar graph of this number on the Shoreline Graph.

   d. Repeat the measuring and graphing procedure for 1960 and 1970.

Lesson Three

A. Finish the measuring and graphing exercise started in Lesson Two.

B. Reinforce the graphic results obtained in the exercise.

   1. Ask students which shoreline was the longer --- the seawall or the mangrove shoreline.

   2. Which shoreline could support more plants and animals?

   3. Have students determine how much the shoreline was shortened from 1950 to 1970.

   4. Review the questions from Lesson One.

C. Post test the class (see Appendix).

APPENDIX

1. Pre/Post Test
2. Mangroves to Seawalls master copy
3. Shoreline Graph master copy

Pre/Post Test

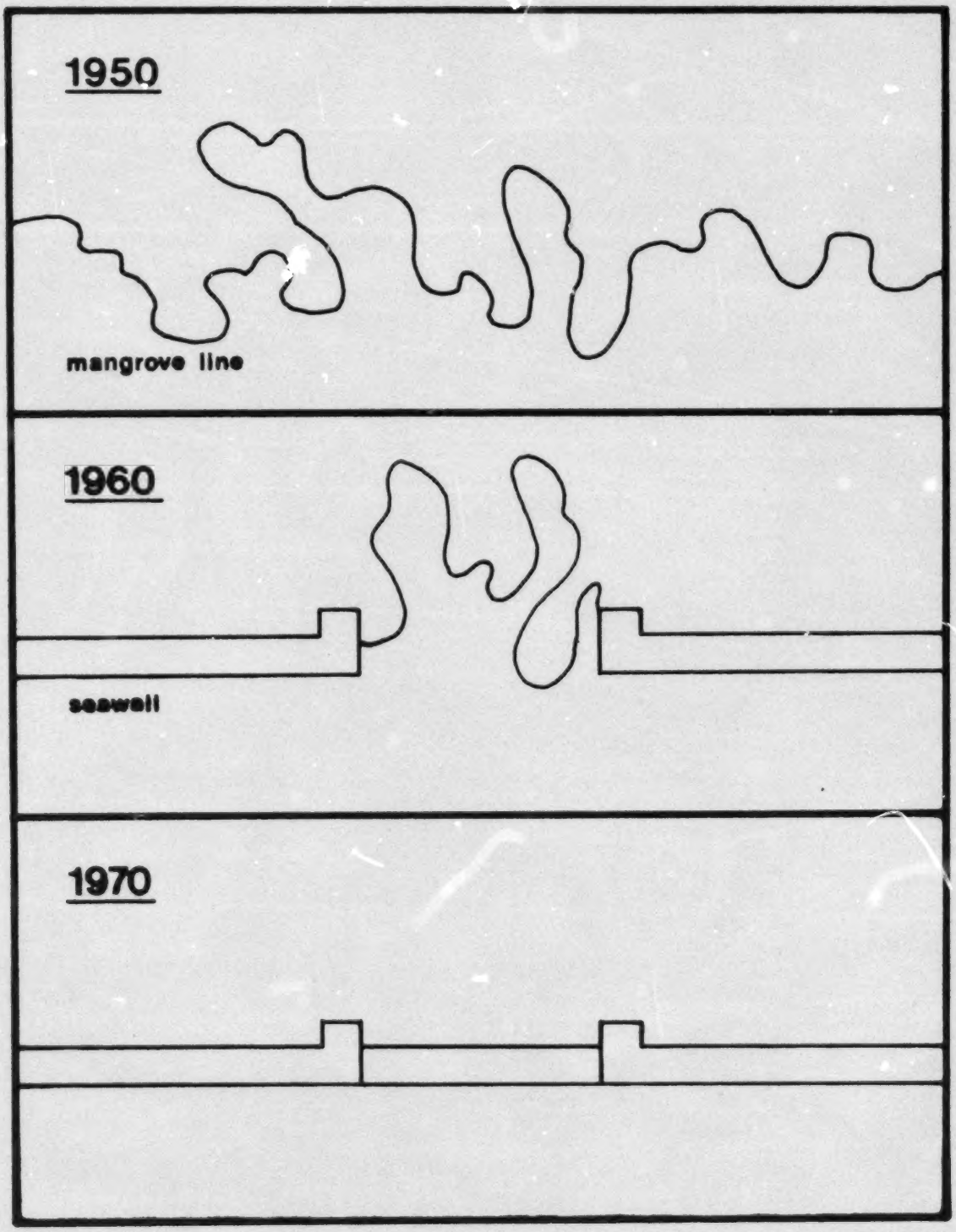
Have students answer these true-false questions on an answer sheet during the first lesson. This will become the Pre-test and should have the student's "name" and "pre-test" on it.

On completion of the module, students should again take the test. Compare the results between pre and post testing.

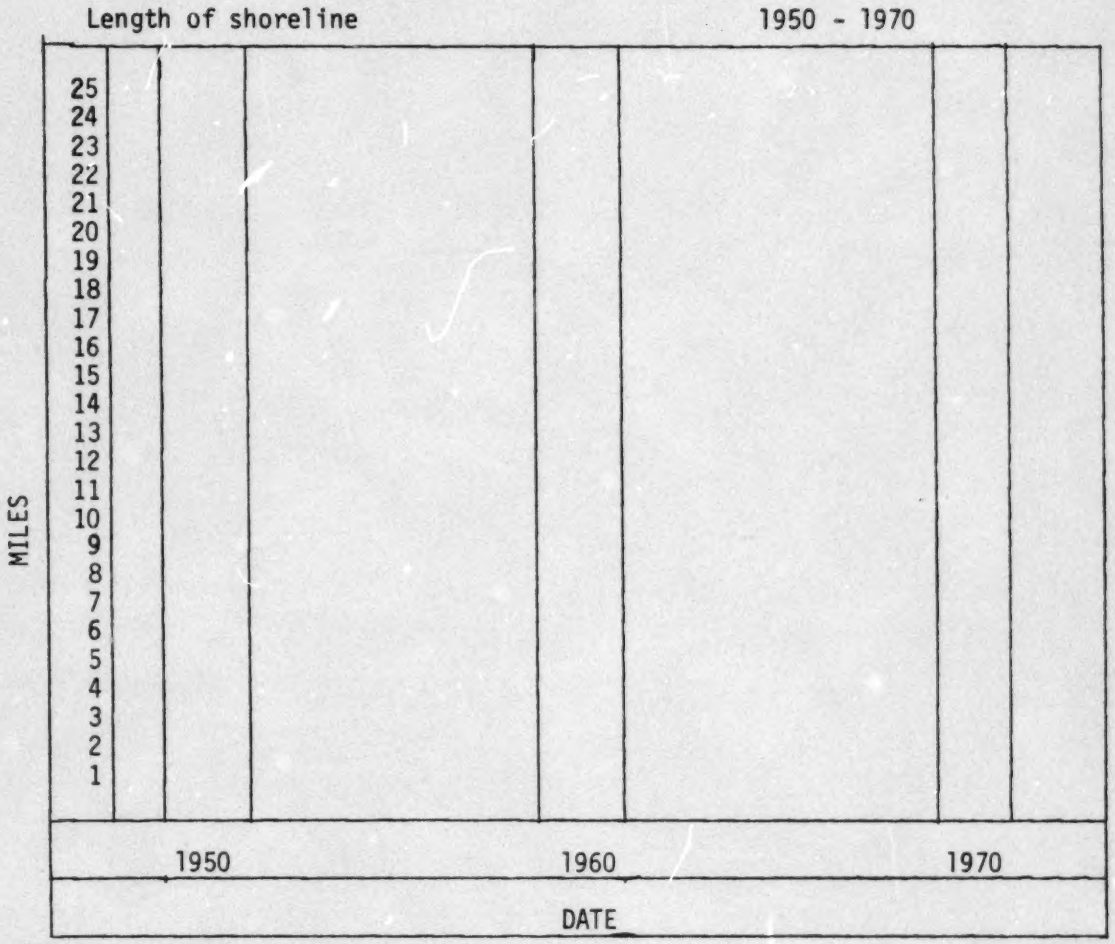
Questions: True or False

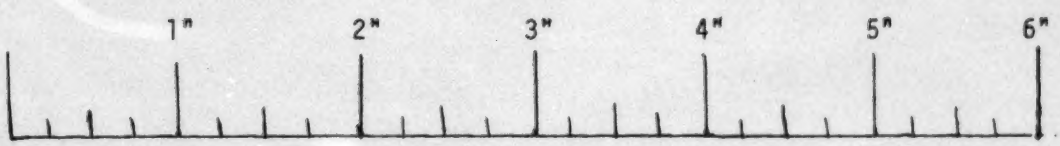
1. Mangroves are coastal trees that live in estuary area.
2. Mangroves cause erosion of our shorelines.
3. When a shoreline is seawalled the distance of the shoreline is increased.
4. Mangroves are important to the economy of an area.
5. In the long run, seawalled property is worth more than mangrove property.

Mangroves to Seawalls



SHORELINE GRAPH





Mile Ruler

LEE COUNTY
ENVIRONMENTAL EDUCATION PROGRAM

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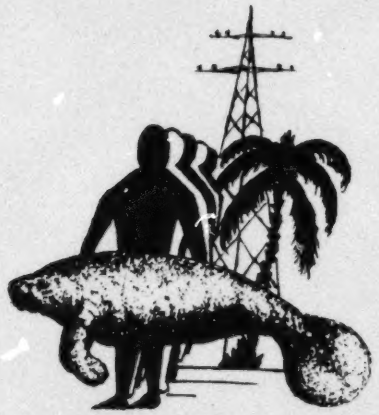

This publication is one in a series developed by the Environmental Education Program for the Lee County Schools, and has been financed by Title III E.S.E.A.

This series is designed to be used by teachers, students and community members to help them to utilize community resources in developing and teaching environmental concepts, responsibility, and in seeking ways to solve environmental problems.

All materials are in preliminary pilot form and may be revised. Sample publications are distributed free to interested school systems. Most publications can serve as models for other school systems in their Environmental Education Programs.

The work presented or reported herein was performed pursuant to a grant from the U.S. Office of Education, Department of Health, Education and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the U.S. Office of Education and no official endorsement by the U.S. Office of Education should be inferred.

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